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Mosses from the west coast of South America

R. S. WILLIAMS

(WITH PLATES 21-25)

A list of mosses collected by Dr. and Mrs. J. N. Rose in Peru, Bolivia and Chile, July to October, 1914, while on a trip undertaken chiefly for the purpose of obtaining Cactaceae.

This collection of 41 mosses, coming as it does largely from the dry cactus region of the west coast of South America, contains for its size an unusually large number of interesting species.

CAMPYLOPUS INCRASSATUS (Kze.) C. M.

PERU: near Mollendo, 18996.

***Campylopus peruvianus* sp. nov.**

Sterile: plants in compact cushions with more or less branching stems, radiculose below, and 10-15 mm. high; leaves ovate-lanceolate, entire except at the apex, closely imbricate, erect-appressed when dry, somewhat spreading when moist, the upper rather larger, 3-4 mm. long, mostly with a short, rough, hyaline point rarely more than 0.5 mm. long; costa about one half the width of the leaf in the lower part, in cross-section showing stereid bands above and below the guide cells and bearing on the back about 24, not serrate, lamellae up to 4 cells in height; alar cells enlarged, mostly pale, extending to the costa; marginal cells of lower leaf narrow and elongate, forming a narrow, hyaline border sometimes extending half way up the leaf; the median cells mostly short-rhomboidal, those just above the alar, short rectangular, all with slightly thickened not pitted walls.

PERU: near Mollendo, August, 18997.

***Astomum chilense* sp. nov.**

Dioicous, the inconspicuous male flowers containing 5 or 6 antheridia with few paraphyses, enclosed by 2 or 3 very small inner perigonal leaves; the outer leaves being scarcely differentiated: plants in rather compact mats with simple stems about 1 mm. high, bearing radicles at base; stem-leaves up to 1.5 mm., rarely 2 mm. long, ovate-lanceolate, more or less folded and crispate when dry, rather widely spreading when moist, with flat, entire margins; costa excurrent into a short apiculus, in cross-

section showing 2 large guide cells, a rather small stereid band between them and the row of large cells next the upper surface, and below the guide cells a much larger stereid band with outer cells somewhat enlarged; cells in lower part of leaf pale, smooth, mostly short-rectangular, about $8\ \mu$ wide by $12\ \mu$ long, in upper part densely papillose, rather distinct, nearly square, about $6 \times 6\ \mu$; perichaetial leaves scarcely differentiated; seta often somewhat bent and twisted when dry, erect when moist, about 2.5 mm. long; capsule oblong, slightly wrinkled when dry, about 1 mm. long, including the short, oblique beak; spores rough, about $16\ \mu$ in diameter; calyptra cucullate, smooth, descending about half way down the capsule.

CHILE: vicinity of La Serena, October, 1920.

GYROWEISIA BOLIVIANA R. S. Williams, Bull. N. Y. Bot. Gard. 3: 104. 1903.

PERU: Cuzco, September, 19057.

LEPTODONTIUM GRACILE C. M.

PERU: vicinity of Lima, July, 18594.

BARBULA FUSCINERVIA Mitt.

PERU: Juliaca, September, 19092.

BARBULA FUSCO-VIRIDIS Broth.

CHILE: Palos Quemnados, October, 19184; La Ligua, October, 19532.

BARBULA REPLICATA Tayl.

PERU: near Oroya, July, 18717; Arequipa, July, 19531; Posco, July, 18813; Cuzco, August, 19055.

Pterogoneurum Roseae sp. nov.

Autoicous, the male flower terminal, the outer perigonal leaves not differentiated, the inner with a very small, pale-golden, roundish, scarcely costate blade bearing a rough, hyaline hair-point 3 or 4 times as long, enclosing 5 or 6 antheridia about $50\ \mu$ long and numerous, somewhat club-shaped paraphyses twice as long as the antheridia: plants appearing somewhat gregarious, only 2-3 mm. high, with very short stems and crowded, bud-like branches; stem leaves when dry, erect, appressed-imbricate, when moist, widely spreading, broadly ovate, serrulate nearly to the base, the blade about 1 mm. long with a rough, hyaline hair-point often exceeding the blade in length, the margins of the upper half of the blade broadly inflexed over the costa; costa expanded in the upper half, in cross-section showing a broad stereid band below

the single row of large cells bearing about 20 rows of filaments 3-5 cells high with the terminal cell often contracted into a mamillate apex; basal cells of leaf pale, short-rectangular to square, up to $20\ \mu$ wide and about $25\ \mu$ long, with walls slightly thickened at the angles, the cells about one half up the leaf becoming more or less transversely elongate, especially toward the margin, with unequally thickened, not pitted, walls; outer perichaetial leaves not differentiated, the 1 or 2 inner leaves very small, pale, narrowly lanceolate, nearly ecostate; seta reddish, 8-9 mm. high; capsule ovate-oblong, nearly symmetric and erect, 2 mm. long with the lid; lid conic, about as high as its basal diameter; peristome papillose, very irregular, from a low basal membrane, the teeth varying from long-lanceolate to little more than lobes scarcely projecting above the annulus; annulus persistent, of a single row of large cells; calyptra cucullate, smooth, extending about half way down the capsule; spores slightly rough, up to $24\ \mu$ in diameter.

PERU: vicinity of Lima, July, 18595 (type); Posco, August, 18813a.

Crossidium Rosei sp. nov.

Autoicous, the male flowers at the apex of the branches, the inner perigonal leaves smaller than the outer, otherwise scarcely differentiated, the 6 to 8 antheridia about 0.25 mm. long, with rather numerous, often longer, filiform paraphyses: plants in rather compact mats, the short stems, with radicles at base, bearing several short branches crowded together bud-like, and 2-3 mm. high; leaves when dry appressed-incurved, often somewhat crispate, when moist, erect-spreading, ovate-oblong to oblong-spatulate, 2-2.5 mm. long, in the upper third finely papillose on both sides, the margins entire and flat or more or less recurved; costa slightly excurrent, enlarged in the upper half, in cross-section showing a large stereid band on the under side and on the upper side some 6-8 large cells, mostly in one row, bearing numerous, short, somewhat club-shaped filaments 2 or 3 cells high with the terminal cell papillose; leaf cells distinct throughout, the basal pale green, nearly square to short-rectangular, up to $20\ \mu$ wide by about $35\ \mu$ long, the median cells scarcely elongate, about $16 \times 16\ \mu$, with walls scarcely thickened; perichaetial leaves hardly differentiated, the inner usually smaller; seta rather flexuous, about 8 mm. long; capsule erect, nearly symmetric, oblong, about 1.5 mm. long with the lid; lid conic, acute, a little higher than its basal diameter, the cells, except at the base, elongate in oblique rows; peristome a papillose basal membrane extending 3 or 4 rows of cells above the persistent annulus, its margin more or less incised and bearing

here and there short lobes; calyptra cucullate, smooth, descending well below the lid; spores rough, up to $25\ \mu$ in diameter.

PERU: vicinity of Lima, July, 18774.

PSEUDOCROSSIDIUM gen. nov.

Dioicous. Small plants with simple or slightly branched stems having a distinct central strand and leaves, when dry, erect-appressed or sometimes twisted about the stem. Stem-leaves with margins in the upper part once to twice revolute, the upper side of the revolute part with cells often much inflated or with greatly enlarged papillae. Costa broader in the upper part than below, nearly percurrent or excurrent; in cross-section about two thirds up showing 5 to 8 guide cells, mostly in one row, beneath them a large stereid band and on the upper side numerous lax, thin-walled cells in 1 to 3 layers forming a continuous, densely papillose surface or sometimes more or less broken up into filaments 2 or 3 cells high with the terminal cells papillose (occasionally, also, a thin band of stereid cells just above the guide-cells in *P. apiculatum*). Cells of the upper part of leaf not or slightly elongate, mostly obscure with crowded papillae on one or both sides, in the lower part, smooth, pale, rectangular or short, more or less transversely elongate. Perichaetial leaves greatly differentiated, the 2 or 3 inner much larger than those of the stem, convolute, pale throughout, with narrow costa mostly vanishing below the obtuse or truncate, nearly or quite entire apex. Capsule nearly cylindrical and erect with a slightly oblique, subulate lid. Peristome of 32 slender, papillose teeth twisted to the left, from a low basal membrane. Annulus of 2 or 3 rows of persistent cells. Calyptra cucullate.

Type species, *P. chilense*.

Pseudocrossidium chilense sp. nov.

Evidently dioicous, the male flowers not found: plants in brownish green cushions with somewhat branching stems, 2–4 mm. high, with a very distinct central strand and walls of outer cells scarcely thickened; stem-leaves erect-appressed when dry, more or less broadly ovate, obtusely or acutely pointed, the upper about 1 mm. long, the lower shorter, rather deeply keeled above with the margins strongly revolute half way down or more; costa nearly percurrent, enlarged in the upper half, 120–140 μ wide, in cross-section above the middle showing 6 to 9 guide-cells mostly in one row, below them a large stereid band and on the upper side 2 or 3 layers of lax, thin-walled cells, those at the surface densely papillose and sometimes more or less separated; cells of upper

part of leaf scarcely elongate, about $6\ \mu$ in diameter, more or less papillose on both sides, in lower part, paler, smooth, mostly nearly square to transversely elongate, often $12 \times 12\ \mu$; perichaetial leaves projecting well above those of the stem, the 2 or 3 inner convolute, about 2 mm. long, mostly broadly rounded or truncate at the entire or nearly entire apex, the leaf-cells mostly slightly elongate throughout with lax, thin walls, smooth or finely papillose on the back in the upper part; seta erect, about 1 cm. long; capsule cylindric, about 2.25 mm. long without lid, the stoutly beaked lid nearly erect, 1 mm. long, with the elongate cells in oblique rows; peristome of 32 slender papillose teeth, twisted about one half around to the left, from a rather low basal membrane; annulus of 2 or 3 rows of small cells; calyptra cucullate, smooth; spores smooth, about $10\ \mu$ in diameter.

CHILE: near Valparaiso, September 1913*b*.

***Pseudocrossidium apiculatum* sp. nov.**

Dioicous, the outer perigonal leaves like those of the upper stem, the inner much shorter, broadly ovate, with narrow costa, enclosing numerous antheridia, 0.4 mm. long, and abundant, slightly club-shaped paraphyses: plants in compact, greenish brown mats with mostly simple stems 1 cm. high, with large, very distinct central stand and outer walls of 1 or 2 rows of rather small cells with scarcely thickened cell-walls; stem-leaves ovate-lanceolate, acute, the upper about 1.5 mm. long, appressed and mostly twisted about the stem when dry, the margins in the upper half often twice revolute; costa excurrent, apiculate, in the widest part $140\text{--}160\ \mu$ across, in cross-section showing 6 to 8 guide cells, below them a large stereid band and on the upper side 3 or 4 layers of lax, thin-walled cells forming a compact densely papillose surface or broken up into distinct filaments 2 or 3 cells high with the terminal cell papillose (sometimes also a thin band of stereid cells occurs just above the guide-cells); cells of upper leaf mostly not elongate or transversely elongate, often $12 \times 12\ \mu$, papillose on both sides, those of the revolute part often much inflated or with greatly enlarged papillae on the upper face; lower cells of leaf paler, mostly rectangular, $12\text{--}16\ \mu$ wide and $20\text{--}40\ \mu$ long; perichaetial leaves pale, convolute, the inner 2.5 mm. long or more, projecting well above the stem-leaves, somewhat obovate to oblong, the apex obtusely rounded and more or less erose, the costa narrow and vanishing a little below the apex; fruit unknown.

PERU: above Arequipa, August, 1897*f*.

[***Pseudocrossidium excavatum* (Mitt.) comb. nov.**

To this genus I would also refer *Tortula excavata* Mitt. Jour.

Linn. Soc. **12**: 154. 1869. It has a cross section of leaf and perichaetial leaves very similar to the preceding but is a much smaller species with stem leaves only about 0.5 mm. long and lacking the sharp apiculate point. From *P. chilense* it may be at once distinguished by the basal cells which are rectangular, not mostly transversely elongate or square. The costa is also narrower, about 60 μ in the widest part. It seems to be known only from the Andes near Quito.]

Desmatodon subtophaceus (R. S. Williams) comb. nov.

Didymodon subtophaceus R. S. Williams, Bull. N. Y. Bot. Gard. **3**: 119. 1903.

PERU: above Arequipa, August, 19533; Juliaca, September, 19099.

CHILE: Las Vacas, near Chiapa, October, 19230.

The stereid band is nearly or quite lacking in the upper part of the costa but present in the lower part.

TORTULA CONFUSA Card.

PERU: Cuzco, September, 19519.

TORTULA KUNZEANA (C. M.) Mitt.

CHILE: La Ligua, 19383; Paloma, October, 19354.

Tortula limensis sp. nov.

Apparently mostly autoicous but occasionally synoicous, the inner perigonal leaves much smaller and paler than the outer and enclosing abundant antheridia, 0.3–0.4 mm. long, with numerous slightly longer, club-shaped paraphyses: plants in compact mats with more or less branching; stems about 1 cm. high having a very small central strand or none; stem-leaves mostly oblong, the larger about 3 mm. long by 1.5 mm. wide, appressed-contorted when dry, somewhat spreading, recurved when moist, with flat or slightly recurved crenulate and papillose margins; costa terete, slightly rough on the back, about 40 μ wide in the lower part, slightly tapering upward, excurrent into a reddish not quite smooth hair-point sometimes over one half the length of the blade, in cross-section showing 2 large guide-cells, below them a stereid band and on the upper side a few thin-walled cells in two layers, the upper surface finely papillose; cells of upper leaf not elongate, densely papillose on both sides, 16–20 μ in diameter, those of basal part pale, smooth, up to 25 μ wide and 60–80 μ long; inner perichaetial leaves very similar to those of the stem but a little larger; seta about 12 mm. long; capsule oblong, slightly curved

and nodding, 2.5 mm. long without the lid, the lid conic, in height often but little exceeding its basal diameter; peristome of 32 pale, nearly erect, very papillose teeth more or less contracted at the joints, from a basal membrane about one-tenth the height of the teeth; annulus of 1 or 2 rows of small cells adherent to the rim of the capsule; calyptra cucullate, descending well below the base of the lid; spores slightly rough, up to $25\ \mu$ in diameter.

PERU: Lima, July, 18603c (type), 18603a; north of Lima, July, 19523.

A species much like some forms of *T. montana* in general appearance.

***Tortula minuscula* sp. nov.**

Dioicous, the terminal bud-like male flower at length appearing lateral by the growth of a subapical branch; the antheridia about 0.3 mm. long, with abundant slightly club-shaped paraphyses: plants in compact, dusky green mats with often branching stems 5–8 mm. high, having a distinct central strand; stem-leaves about 2 mm. long, appressed or somewhat erect-spreading when dry, rather broadly ovate-lanceolate, entire, the margins somewhat recurved along the middle and thickened with 1 row of additional cells in the narrow-grooved point; costa percurrent, often slightly broadened and flattened near the middle of the leaf with a cross-section showing 10 to 12 guide cells, a single row of cells nearly as large on the ventral side and on the dorsal side a row of slightly smaller cells with a few stereid cells between them and the guide-cells; the cross-section near apex shows no stereid cells and only 2 guide-cells; cells of upper part of leaf very papillose on both sides, the median often slightly transversely elongate, about $5 \times 8\ \mu$, the basal short-rectangular to nearly square; perichaetial leaves very similar to those of upper stem but with slightly larger and paler base; seta 6–7 mm. long; capsule erect, ovate-oblong, about 1 mm. long without the lid; the lid slightly oblique, conic-subulate, scarcely 0.5 mm. long; peristome from a papillose basal membrane projecting well above the annulus, of 32 erect or nearly erect, very papillose teeth of irregular length; annulus of 2 or 3 rows of persistent cells; calyptra cucullate, smooth, descending well below the lid; spores smooth, about $10\ \mu$ in diameter.

PERU: Cuzco, September, 19520.

***Tortula muralis* (L.) Hedw.**

CHILE: Viña del Mar, near Valparaiso, September, 19105; Las Vacas, near Chiapa, 19230a; vicinity of La Serena, 19289; vicinity of Illapel, 19462, 19462d; La Paloma, October, 19522.

ENCALYPTA EMERSA C. M.?

BOLIVIA: Comanche, August, 18884.

This plant is perhaps distinct from *E. emersa*, of which I have seen no specimens. The Bolivian plant is autoicous with stems rather stout, about 2 cm. high; stem-leaves oblong, about 4 mm. long by 2 mm. broad, the apex rounded, the margins somewhat crenate and papillose; costa vanishing a little below the apex, rough on the back with pale spines, simple toward the apex, branching at the middle and lower part of the costa; capsule cylindric, nearly smooth, emergent, without peristomé; calyptra entire at base, somewhat scabrous at apex.

ALIGRIMMIA PERUVIANA R. S. Williams, Bull. N. Y. Bot. Gard. 3: 124. 1903.

PERU: vicinity of Arequipa, August, 18823, the locality from which the type specimens were described.

GRIMMIA MICRO-OVATA C. M.

BOLIVIA: Comanche, August, 18882a; vicinity of Comanche, August, 18882; vicinity of La Paz, August, 18870.

GRIMMIA SAXATILIS Mitt.

PERU: Juliaca, September, 19091.

ZYGODON CIRCINATUS Mitt.

PERU: near Mollendo, August, 19526. Type specimens collected on the island of Chiloe, Chile, and apparently unknown elsewhere, excepting from this Peruvian collection.

Physcomitrium Roseae sp. nov.

Antheridia not found: plants in thin mats or somewhat gregarious, with stems about 2 mm. high, scarcely projecting above the earth over which they grow with the rosette-like cluster of leaves resting on the surface; stems with a few radicles at the base and 5 to 7 leaves clustered at the apex; leaves mostly ovate, acute, with flat, entire margins, about 2.5 mm. long by 1.5 mm. wide, with sometimes 1 or 2 much smaller inner leaves; costa percurrent, weak, in cross-section showing 5 or 6 cells of somewhat variable size without thickened walls; cells of upper part of leaf more or less hexagonal, 20–25 μ in diameter, toward the base square to rectangular, about 25 μ wide and 30–50 μ long; seta 2 mm. long; capsule subglobose, about 1.5 mm. high, without annulus and peristome, the cells about the rim elongate in 5 or 6

rows, forming a rather ill-defined border, those below to near the base very irregular, becoming at the base smaller, quite regular and with small stomata in several rows; lid nearly flat, with an ill-defined border of transversely elongate cells that become toward the center of lid much broader and larger; spores mostly roundish, smooth, $28-30\ \mu$ in diameter; calyptra (perhaps not normal) remaining attached to the seta half way down the capsule, teretecylindric, smooth.

CHILE: near Valparaiso, September, 19176.

FUNARIA CALVESCENS Schwaegr.

BOLIVIA: vicinity of La Paz, August, 18858.

FUNARIA HYGROMETRICA (L.) Sibth.

PERU: vicinity of Chosica, June, 18549; Arequipa and vicinity, August, 18822, 19001; Juliaca, September, 19098.

CHILE: near Valapraiso, September, 19106, 19107, 19132a; Santiago, September, 19181.

FUNARIA MACROSPORA R. S. Williams, Bull. N. Y. Bot. Gard. 3: 133. 1903.

BOLIVIA: La Paz, August, 19463; Araranca, August, 19527.

PERU: Arequipa, August, 19528. The spores in all these specimens are rough and the larger measure $25-30\ \mu$. Possibly the species is not distinct from *F. hygrometrica*. The plants are all much larger than any specimens of *F. hygrometrica arctica* I have seen.

FUNARIA SUBERECTA Mitt.

CHILE: vicinity of Illapel, October, 19462a.

MIELICHHOFERIA CAMPYLOTHECA C. M.

BOLIVIA: Comanche, August, 18884a.

HAPLODONTIUM JAMESONI (Tayl.) Hpe.

PERU: Juliaca, September, 19097.

HAPLODONTIUM SERIOLUM C. M.

PERU: Juliaca, September, 19518.

LEPTOBRYUM PYRIFORME (L.) Wils.

BOLIVIA: Araranca, August, 19464.

LEPTOBRYUM WILSONI (Mitt.) Broth.

PERU: Arequipa and vicinity, August, 19514, 19517.

ANOMOBRYUM FILIFORME (Dicks.) Husn.

PERU: above Toyatoya, August 18941; Juliaca, September, 19101.

BRYUM CONCAVUM Mitt.

BOLIVIA: La Paz, August 18895, 18896, 19463a.

PERU: Arequipa, August, 19529; Cuzco, September, 19056, 19058.

BARTRAMIA FRAGILIFOLIA C. M.

BOLIVIA: vicinity of Comanche, August, 19524.

Philonotis fragilicaulis sp. nov.

Flowers and fruit not known; plants in compact cushions with slender, branching stems, mostly denuded of leaves in the lower part and without radicles, 3-4 dm. long and 0.25 mm. in diameter, having a large well-defined central strand and often rough surface in the older parts from the large, mamilllose-inflated outer cells; leaves nearly erect and loosely imbricate-incurved when dry, scarcely spreading when moist, ovate-pointed, about 1.5 mm. long and 0.75 mm. wide, the margins flat, serrulate in the upper part, sometimes crenulate nearly to the base; costa stout, rough on the back in the upper half, excurrent into a serrulate, short or somewhat elongate and subulate point; cells of leaf on the under surface, more especially the median cells, mamilllose-inflated at the base, those of the upper leaf mostly somewhat elongate, more or less quadratic, the median 8-12 μ wide and 20-30 μ long, the basal rather larger and more rectangular.

PERU: Araranca, 4260 m. alt., August, 19513.

POGONATUM POLYCARPUM (Schimp.) Broth.

PERU: Juliaca, September, 19100.

HEDWIGIDIUM IMBERBE (Sw.) Bry. Eur.

BOLIVIA: vicinity of Comanche, 18883.

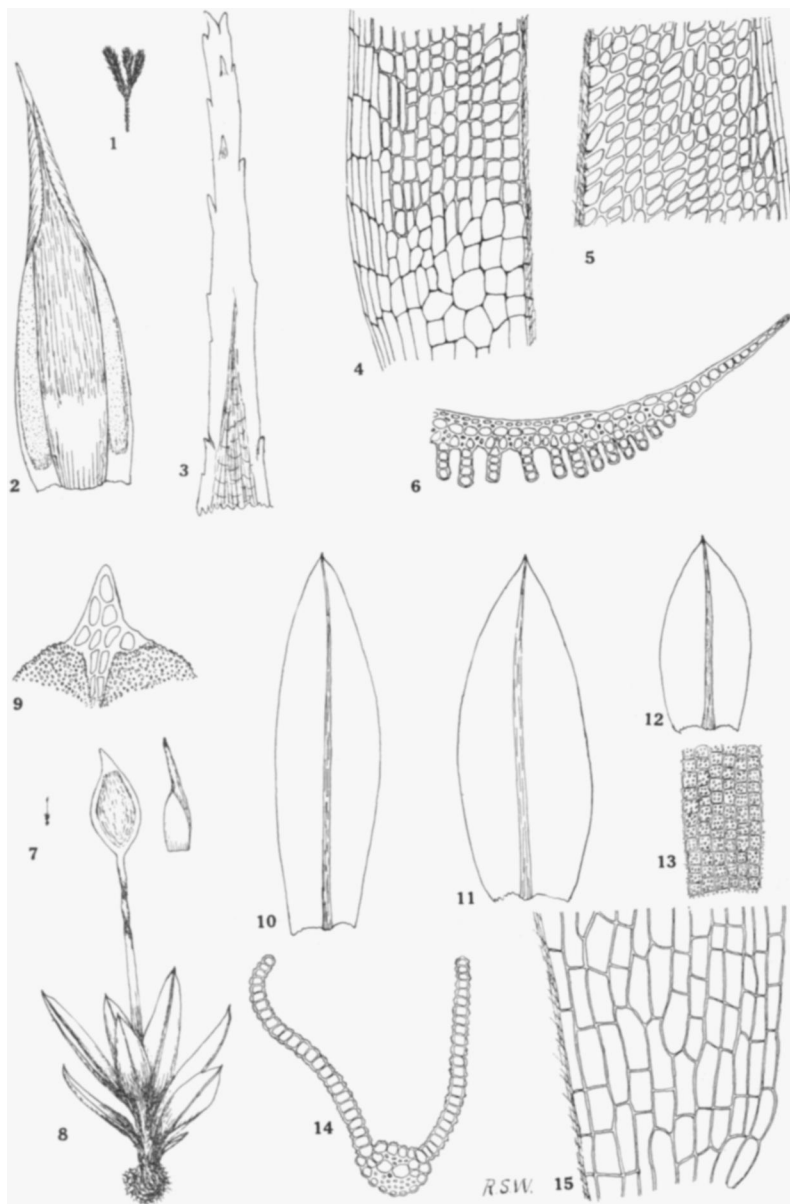
FABRONIA ANDINA Mitt.

BOLIVIA: vicinity of La Paz, August, 18857, 18871; Comanche, August, 19515.

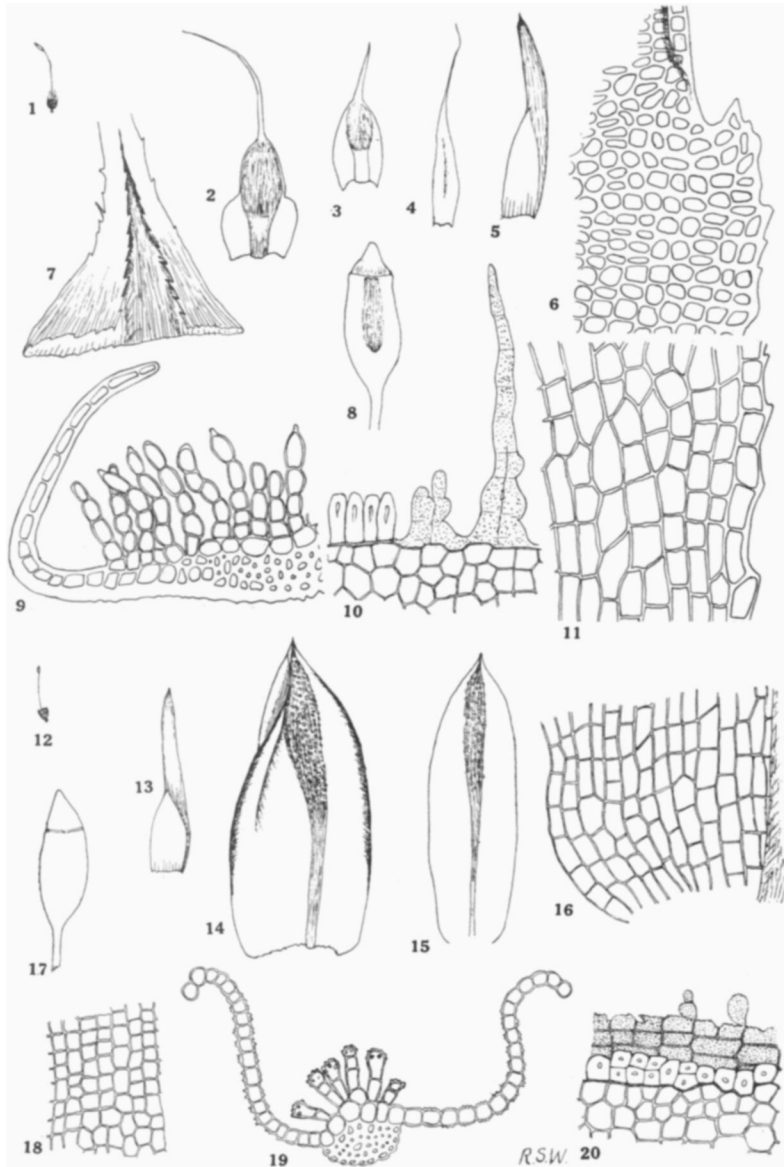
LESKEA GRACILLIMA Tayl.

PERU: Cuzco, September, 19059, 19530.

One specimen (No. 18603b) is not determined. It is possibly a small *Pohlia*, but lacks fruit and may belong elsewhere.

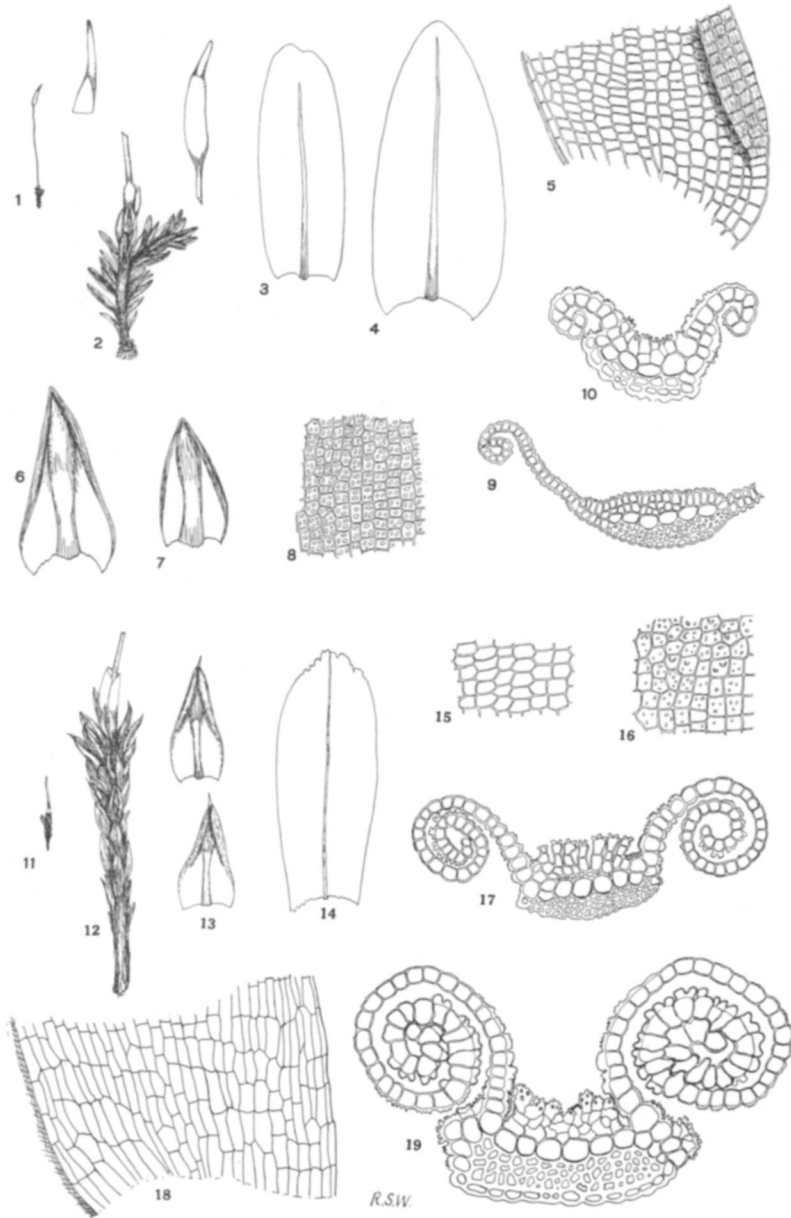


1-6. *CAMPYLOPUS PERUVIANUS* R. S. WILLIAMS
 7-15. *ASTOMUM CHILENSE* R. S. WILLIAMS



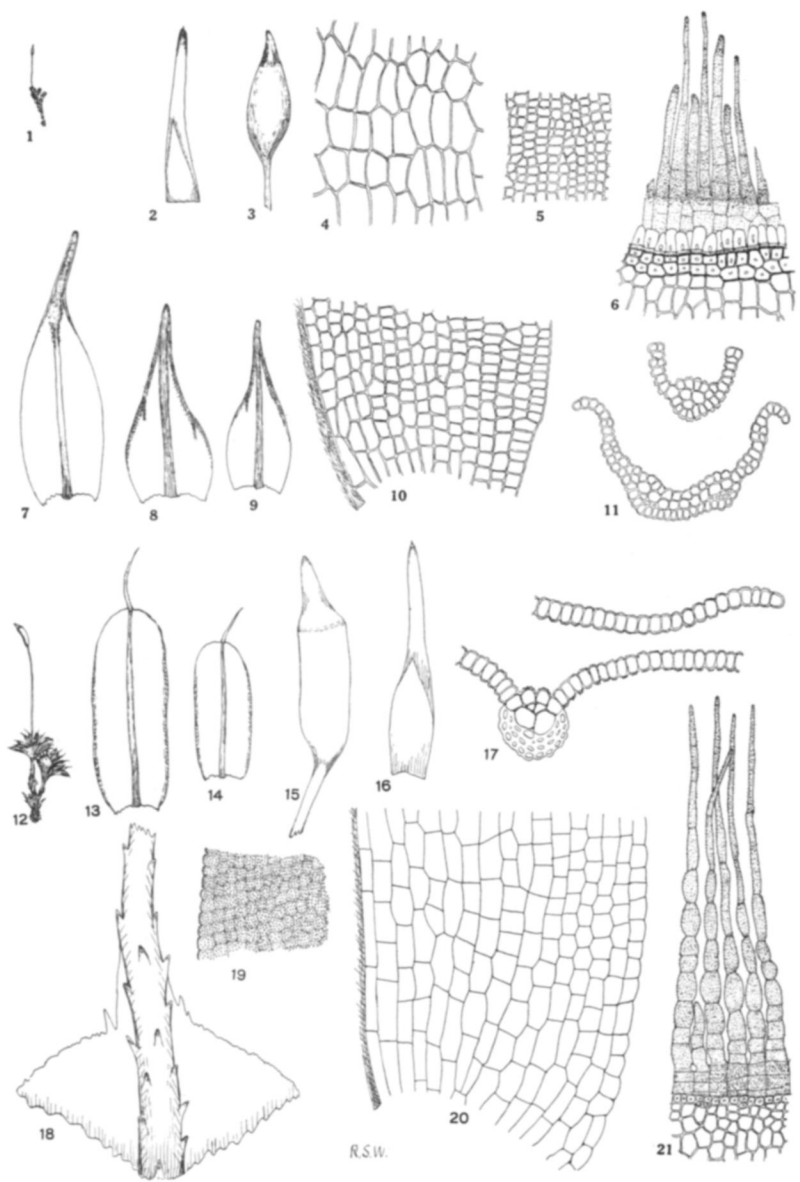
1-11. *PTEROGONEURUM ROSEAE* R. S. WILLIAMS

12-20. *CROSSIDIUM ROSEI* R. S. WILLIAMS

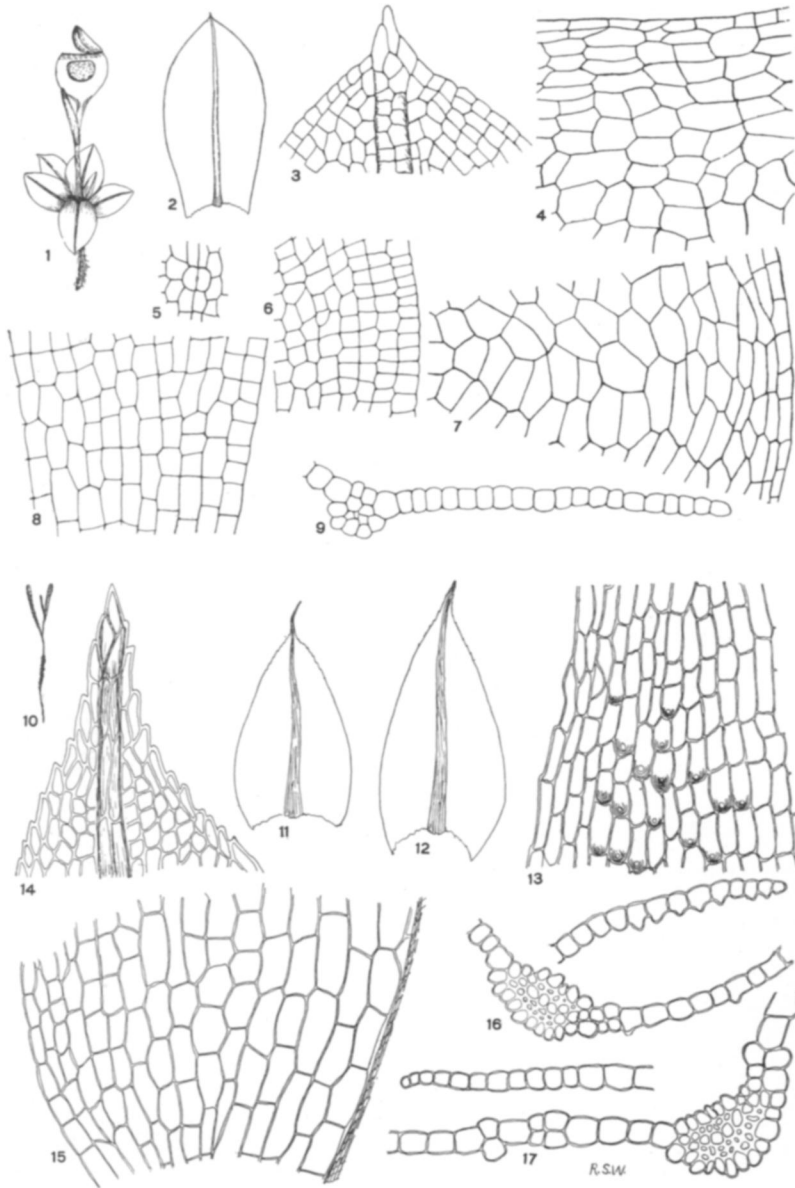


1-10. *PSEUDOCROSSIDIUM CHILENSE* R. S. WILLIAMS

11-19. *PSEUDOCROSSIDIUM APICULATUM* R. S. WILLIAMS



1-11. *TORTULA MINUSCULA* R. S. WILLIAMS
12-21. *TORTULA LIMENSIS* R. S. WILLIAMS



1-9. *PHYSCOMITRIUM ROSEAE* R. S. WILLIAMS

10-17. *PHILONOTIS FRAGILICAULIS* R. S. WILLIAMS

Explanation of plates 21-25

PLATE 21

Campylopus peruvianus. 1. Plant about natural size. 2. Stem-leaf, $\times 18$. 3. Hyaline point of leaf, $\times 103$. 4. Basal cells on one side of costa, $\times 124$. 5. Median cells of leaf, $\times 124$. 6. Half a cross-section near the middle of leaf, $\times 124$.

Astomum chilense. 7. Plant about natural size. 8. Plant, $\times 10$. 9. Apex of leaf, $\times 183$. 10 and 11. Upper stem leaves, $\times 20$. 12. Lower stem leaf, $\times 20$. 13. Median cells of leaf, $\times 183$. 14. Cross-section of leaf about half way down, $\times 124$. 15. Basal cells on one side of costa, $\times 124$.

PLATE 22

Pterogoneurum Roseae. 1. Plant about natural size. 2. Upper leaf, $\times 10$. 3. Lower leaf, $\times 10$. 4. Inner perichaetial leaf, $\times 10$. 5. Calyptra, $\times 10$. 6. Cells at the shoulder of leaf about half way up blade, $\times 124$. 7. Apex of leaf-blade, $\times 46$. 8. Capsule, $\times 10$. 9. Half a cross-section near the middle of leaf, $\times 124$. 10. Part of peristome, annulus and rim of capsule, $\times 124$. 11. Basal cells from margin extending only part of the way to costa, $\times 124$.

Crossidium Rosei. 12. Plant about natural size. 13. Calyptra, $\times 11$. 14 and 15. Upper and middle stem leaves, $\times 18$. 16. Basal cells on one side of costa, $\times 124$. 17. Capsule, $\times 11$. 18. Median leaf cells, $\times 124$. 19. Cross-section about one third down leaf, $\times 103$. 20. Part of peristome, annulus and rim of capsule, $\times 124$.

PLATE 23

Pseudocrossidium chilense. 1. Plant about natural size. 2. Plant, $\times 9$. 3 and 4. Perichaetial leaves, $\times 20$. 5. Basal cells on one side of costa, $\times 124$. 6 and 7. Upper and middle stem leaves, $\times 20$. 8. Median cells of leaf, $\times 183$. 9. Cross-section of leaf below the middle, $\times 124$. 10. Cross-section above the middle, $\times 183$.

Pseudocrossidium apiculatum. 11. Plant about natural size. 12. Plant, $\times 6$. 13. Stem-leaves, $\times 13$. 14. Perichaetial leaf, $\times 13$. 15. Cells in upper leaf about midway between margin and costa, $\times 183$. 16. Cells just above the rectangular basal cells, $\times 183$. 17. Cross-section of leaf about one third down, $\times 124$. 18. Basal cells of leaf from margin to costa, $\times 124$. 19. Cross-section of a second leaf, $\times 183$.

PLATE 24

Tortula minuscula. 1. Plant about natural size. 2. Calyptra, $\times 14$. 3. Capsule, $\times 14$. 4. Median exothecal cells, $\times 124$. 5. Median cells of leaf, $\times 183$. 6. Part of peristome, annulus and rim of capsule, $\times 183$. 7. Perichaetial leaf, $\times 20$. 8 and 9. Stem leaves, $\times 20$. 10. Basal cells of leaf from margin to costa, $\times 183$. 11. Cross-sections of costa in upper part and near the middle, $\times 183$.

Tortula limensis. 12. Plant about natural size. 13 and 14. Stem-leaves, $\times 6$. 15. Capsule, $\times 6$. 16. Calyptra, $\times 6$. 17. Cross-section of leaf, $\times 124$. 18. Apex of leaf-blade and costa on under side, $\times 124$. 19. Median cells of leaf, $\times 124$. 20. Basal cells of leaf from margin to costa, $\times 124$. 21. Part of peristome, annulus and rim of capsule, $\times 124$.

PLATE 25

Physcomitrium Roseae. 1. Plant, $\times 5$. 2. Leaf, $\times 14$. 3. Apex of leaf, $\times 100$. 4. Cells about rim of capsule, $\times 100$. 5. Cells at base of capsule surrounding a stoma, $\times 100$. 6. Median cells of leaf, $\times 100$. 7. Cells of lid from margin to center, $\times 100$. 8. Basal cells of leaf from margin to near the costa, $\times 100$. 9. Part of cross-section of leaf near the middle, $\times 100$.

Philonotis fragilicaulis. 10. Plant, about natural size. 11 and 12. Stem leaves, $\times 23$. 13. Median cells of leaf showing mamillae at the lower and under surface, $\times 183$. 14. Leaf at apex, $\times 183$. 15. Basal cells of leaf from margin to costa, $\times 183$. 16. Part of cross-section of leaf near the middle, $\times 183$. 17. Part of cross-section of leaf a little below the middle, $\times 183$.